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ABSTRACT

This teaching unit, Geologist, is one in a series of career guides developed by Project CHOICE (Children Have Options in Career Education) to provide the classroom teacher with a source of career-related activities linking third and fourth grade elementary classroom experiences with the world of work. Part of the Science and Engineering Occupations Career Cluster, these ten lessons discuss job responsibilities of four types of geologists and relate school skills to the skills used by geologists in their work. An introductory section gives the rationale for the unit, goals, performance objectives, entry-level assessment, and evaluation. A list of instructional materials, such as films, filmstrips, books, art supplies, and community resources, is included in this section. Each lesson contains a statement of purpose, materials needed for the lesson, an introductory statement, class activities, and a summary activity. Written materials (such as worksheets, surveys, and task cards) are included where feasible. (This guide is one of twenty-four in the series for grades 3 and 4--CE 025 766-789.) (MEK)

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OFFICE OF CLAUDE W. RICHARDSON
KERN COUNTY SUPERINTENDENT OF SCHOOLS

Project CHOICE
#106

A CAREER UNIT FOR GRADES 3 AND 4

GEOLOGIST

(Science and Engineering Occupations Career Cluster)

CE 085 772

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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February, 1978

FOREWORD

Project CHOICE: Children Have Options in Career Education, is an Exemplary Project from the San Diego City School District, which has been adapted, with ESEA Title IV-C funding, for Kern County Schools.

Through Project CHOICE, units have been developed to provide the classroom teacher with a source of career-related activities linking classroom experiences with the world of work. All students, regardless of their post-high school plans, share an equal need for career awareness, decision making skills, and other elements of career education. This goal can be accomplished if all teachers and counselors "fit" the appropriate units where they best apply in the curriculum.

We are indebted to the San Diego City School District, and the Project CHOICE staff, for developing and field testing the original units.

For their excellent work in re-writing the units in order to adapt them for use in Kern County Schools, we wish to recognize:

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Science and Engineering Occupations Career Cluster

GEOLOGIST

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Science and Engineering Occupations Career Cluster

GEOLOGIST

RATIONALE

Geologists are often called "earth scientists". Children are curious about the earth, its history, composition and the various processes which changed or will change the structure and surface features. This is a unit in which children will learn about the various jobs related to geology, as well as the role geology can play in their own lives.

GOALS

Through this unit, pupils will:

-Become familiar with the many jobs related to geology.

-Relate school skills to the skills used by geologists.

-Consider the importance of geology in their daily lives.

-Become familiar with the various job responsibilities of geologists in these areas: structural geologist, geomorphologist, paleontologist.

PERFORMANCE OBJECTIVES

By the end of this unit, pupils will be able to:

-Name four kinds of geologists.

-List four school skills necessary to a geologist.

-Tell why geology is important in their daily lives.

-Tell about the kind of work done by structural geologists, geomorphologists, and paleontologists.

ENTRY LEVEL ASSESSMENT
(To be used as a pre-test and a post-test).

Use this informal inventory to determine the class awareness of geologists.

1. What does the science of geology involve?

2. What kind of work is done by a structural geologist? a geomorphologist? a paleontologist?

3. How does the work of geologists contribute to our daily lives?

4. Where do geologists work?

5. What school skills would be needed by a geologist?

EVALUATION

The final lesson has been set aside for evaluation. The Entry Level Assessment may be used as a pretest as well as a post-test, or the teacher may wish to develop his/her own. Responses may be taped or written, so that comparisons may be made in order to determine how well pupils have achieved the objectives.

Note to the teacher:

The vocabulary may be beyond the level of the students in the class. It is difficult to maintain the meaning and value of this scientific work without exposing students to the proper terms. The teacher will have to interpret vocabulary meanings for the students.

SUGGESTED INSTRUCTIONAL MATERIALS

The following materials and equipment may be used in this unit:

-Films and filmstrips as listed.
-Books as listed.
-Film projector, filmstrip projector.
-Record player.
-A variety of art materials.
-Permission slips.
-Task cards.
-Tape recorder, tape.

Films:

Birth of Land (I)
Birth and Death of Mountains (I)
Geological Work of Ice (I)
Wind at Work (I)
Our Changing Earth (I)
Why Do We Still Have Mountains (I)
Lands and Waters of Our Earth (P-I)
Rocks (P-I)
Earthquakes and Volcanoes (I-J)
Geysers and Hot Springs (I-J)

Filmstrips:

Earth's Surface (P)
Volcanoes, Geysers, and Hot Springs
Our Changing Earth (I)
Earth Is Always Changing (P)
How the Earth's Surface Changes (P)
The Story of Ice and Glaciers (I)
Water and Soil (P)
Story of the Earth's Crust (I)
Rocks and How They Change (P)
Stories Fossils Tell (I)

Books:

Number	Title	Author
551.1	The Earth's Crust	Adler
551 & Sci	The Earth's Story	Ames
551	The Earth	Beiser
551	The Crust of the Earth; the Story of Geology	Clayton
550	Geology of the Earth	Creative Education Society
551 & Sci (P)	What Is The Earth?	Darby
551 & Sci (I)	Great Mysteries of the Earth	Hapgood
551	The First Book of the Earth	Sevrey
551 & Sci (I)	Your Changing Earth	Ruchlis
551.2	Let's Read about Mountains and Volcanoes	Ware
551 & Sci (P)	What's Inside the Earth	Zim
550	World of Science	Werner
California State Series:		
	Rocks and Minerals	
	Stories Read from the Rocks	
	The Earth and Its History	

AVAILABLE IN INSTRUCTIONAL RESOURCE CENTER: OFFICE OF THE KERN COUNTY SUPERINTENDENT OF SCHOOLS
(Please preview first, to be certain of suitability for specific students and situations).

Films:
MP 5084 Lands and Waters of our Earth
MP 4980 Finding Out About Rocks
MP 5213 Rocks for Beginners
MP 1830 Volcanoes in Action
MP 5210 Rocks
MP 5381 Yosemite National Park - The Four Seasons
MP 5938 Erosion
MP 597 Why Do We Still Have Mountains

Models: 1790 Rock and Mineral Specimens

Filmstrips: 5085 Land and Water We See
5059 How the Earth's Surface Changes
5211 Rocks and How They Change
1587 Earthquakes, People, and Schools

COMMUNITY RESOURCES

Phil Ryalls; consulting geologist; office, 323-7795; home, 399-1169; Bakersfield.

Fieldtrip:

Museum of Natural History; Los Angeles, California.

INSTRUCTIONAL STRATEGY: LESSONS 1 - 10

Lesson 1

PURPOSE

To make students aware of what the science of geology involves. To administer a pre-test and introduce the study of geology.

MATERIALS

1. Entry Level Assessment.
2. Tape recorder and tape.
3. Film: Lands and Waters of Our Earth, 5084 (Available through Instructional Resource Center, Superintendent of Schools).
4. Film projector.

INTRODUCTION

Say: "Scientists who study the earth and its history are called geologists. They are sometimes called 'earth scientists'. They are concerned with the history, composition (make-up), and surface features such as mountains and canyons of the earth. Today we will begin our study of scientists who work in the field of geology. Let's try to think of some jobs these people might do." (List as many as the students can name.)

CLASS ACTIVITIES

1. Administer pre-test.
2. Discuss the questions on the pre-test as an introduction to the unit.
3. Talk about geology as a science, what it involves and what we know about the kind of work geologists do.
4. Make a list of jobs geologists might be involved in.
5. View film.

SUMMARY

1. Review ideas gained from discussion.
2. Review film.
3. Review list of jobs that geologists might be involved with. The students will want to add to the list as the unit progresses.

Lesson 2

PURPOSE

To familiarize students with the many scientists involved with work in specialty and subspecialty areas of geology.

MATERIALS

1. Teacher Information Sheet, next page.
2. Task Cards 1 through 3.
3. Book: The Earth and Its History, California State Series.
4. Student Information Sheet, following pages.

INTRODUCTION

Say: "Yesterday we learned that geologists are sometimes called 'earth scientists'. The field of geology has over 30 kinds of special job areas where people work. Each area employs many people. The largest number of geologists are employed in exploration and production of petroleum and natural gas. (Explain what is meant by exploration and production and petroleum.) Other geologists do research, teach and work in special areas. Let's look at the information sheet that I have for you." (The teacher will have to read this with the students and help interpret meanings. The vocabulary may be beyond their level. It is difficult to maintain the meaning and value of this scientific work without exposing students to the proper terms.)

CLASS ACTIVITIES

1. Read Student Information Sheet.
2. With the aid of a tutor read parts of the book.
3. Do task cards.
4. Show in a picture the field of geology you find interesting.

SUMMARY

1. Reports from students using task cards.
2. Share pictures.
3. Report the findings from the book.
4. Review the Student Information Sheet.

Teacher Information Sheet:

GEOLOGIST

Geologists are sometimes called 'earth scientists'. They are concerned with the history, composition and the various processes which changed or will change the structure and surface features of the earth.

The field of geology has over thirty specialties and sub-specialties. The largest number of Geologists are employed in the exploration and production of petroleum and natural gas. Others are involved with research, consultation or teaching. Many Geologists are specialists in several categories.

Economic Geologists find and oversee the development of natural resources, such as minerals. They may be named by their sub-specialty such as: Petroleum Geologist if working in mine exploration and development, Mineralogists investigate the origin, composition, and properties of minerals and classify them, Paleontologists study, identify and classify animal and plant fossils, Geohydrologists are concerned with surface and underground water supplies. Ground Water Geologists are interested in the occurrence and quality of water found only beneath the surface.

Engineering Geologists search for construction sites and solve geological engineering problems in building highways, bridges, dams, airfields, tunnels, etc. Those who are concerned with strategic placement of military construction are called Military Geologists. Photo-Geologists examine and interpret aerial photographs of the earth and its land formations. Structural Geologists study rock formations and rock layers and the forces which produced or changed them. Petrologists research the origin and composition of rocks, while the Petrographer deals with the detailed description and classification of rocks. Geomorphologists study land formations and topographical features, including their origin and the forces which caused them such as glaciers, erosion, etc. Sedimentologists study the origin, movement and characteristics of sedementary deposits.

Other specialties and their primary field of study include:

-Volcanologists: volcanos

-Selenologists: moon

-Astrogeologists: moon, planets, solar system

-Geographic or Geological Oceanographer and Marine Geologists: ocean bottom, rocks and formations.

Student Information Sheet:

Geologists are sometimes called 'earth scientists'. People work in many kinds of special job areas. Each job area employs many people. Here are some of the special kinds of job areas where the geologists might work.

1. Economic Geologist: works to develop the earth's natural resources such as minerals (resources are like the earth's wealth.)

2. Petroleum Geologist: works to explore and develop mines.

3. Mineralogist: investigates what makes up minerals, what they are like and where they come from. He will also classify them - put them in special classes.

4. Paleontologist: works to study, name and classify animal and plant fossils.

5. Geohydrologist: works to study water supplies on land and underground.

6. Ground Water Geologist: works to find and study the water underground.

7. Engineering Geologist: looks for construction (building) locations and solves geological problems in building highways, bridges, dams, airfields, tunnels, etc.

8. Military Geologist: looks for the best place to build military bases, etc.

9. Photo-Geologist: looks at the aerial pictures of the earth and studys the way the land is formed.

10. Structural Geologist: studies rock formations, layers of rocks. Also studies changes in rock formations and tries to find out the reasons for the change.

11. Petrologist: studies where rock came from and what rocks are made of.

12. Geomorphologist: studies land formations such as mountains and canyons. They are also interested in how the land was formed and what caused it - glaciers, erosion, etc.

13. Volcanologist: studies volcanoes.

14. Selenologist: studies the moon.

15. Geological Oceanographer: studies the ocean bottom, rocks and formations.

Lesson 3

PURPOSE

To make students aware of the importance of geology in their own lives.

MATERIALS

1. Filmstrip: Land and Water We See, (Available through Instructional Resource Center, Superintendent of Schools).
2. Filmstrip projector.
3. Task Cards 1 through 3.
4. Book: The Earth and Its History.

INTRODUCTION

Say: "Today we will consider ways in which study and work in the field of geology is important in our lives. Let's think about these questions:

1. Why is it important for us to know about plants and animals that lived a long time ago?
2. Is petroleum and natural gas important to our lives? How?
3. Why are minerals important?
4. Why must we know about underground water supplies?
5. Why must we be concerned about construction locations for bridges, highways, dams, airfields and tunnels?
6. Why is it important for us to know about rock and land formations?
7. Why must we know about land forms?
8. Is it important to know about the reasons change happens (erosion, volcanos, glaciers)?

Teachers will have to explain and interpret meaning of various terms such as petroleum and minerals.

CLASS ACTIVITIES

1. Discussion based on introduction questions. (Teachers may want to make a chart using the questions in the introduction, adding answers and knowledge gained as the unit progresses.)
2. View filmstrip.
3. With the aid of a tutor read parts of the book.
4. Use task cards.
5. Write or illustrate: "How the Work of the Geologist Affects Me and My Family."

SUMMARY

1. Summarize the discussion.
2. Review the filmstrip.
3. Report the findings from the book.
4. Share stories and/or illustrations.
5. Reports from students using task cards.

Lesson 4
(Note: Lesson 5 is a continuatin of Lesson 4)

PURPOSE

To familiarize the students with the job of the Structural Geologists.

MATERIALS

1. Suggested filmstrips: How the Earth's Surface Changes, 5059 and/or Rocks and How They Change, 5211. (Available through Instructional Resource Center, Superintendent of Schools).
2. Filmstrip projector.
3. Task Cards 4 through 8, also 9 through 13 from Lesson 5.

INTRODUCTION

Say: "Today we are going to learn about the job of a structural geologist. This scientist studies rock formations and rock layers. They also study changes that happen to rock formations and try to find out what caused the change. Structural geologists try to estimate the age of the earth. They get most of their information by studying the position of rock layers, and the contents of the rock layers. In our next lesson we will learn how the structural geologist studies and learns about mountains. Our filmstrips today will show us how the thin layer called the 'earth's crust' has changed."

CLASS ACTIVITIES

1. View filmstrips.
2. Assign task cards.

SUMMARY

1. Discuss highlights of the filmstrips.
2. Reports from students using task cards.

Note: Lessons 4 and 5 are dual lessons. Assigning activities for these lessons should be convenient for the teachers. Filmstrips and films could be shown on different days and the task cards could be assigned both days.

Lesson 5

PURPOSE

To familiarize the students with the job of the Structural Geologist. (Continuation of Lesson 4.)

MATERIALS

1. Suggested film: Volcanoes in Action, 1830 and/or filmstrip; Earthquakes, People and Schools, 1587. (Available through Instructional Resource Center, Superintendent of Schools).
2. Film and/or filmstrip projector.
3. Task Cards 9 through 13, also 4 through 8, from Lesson 4.

INTRODUCTION

Say: "Today we will continue our study of the Structural Geologist." (The teacher may want to review Lesson 4 at this point.)
"In this lesson we will learn how the Structural Geologist studies mountains. Mountains are formed by volcanic eruption and by the earth's crust moving up. This upward movement is caused by the folding and bending of rock layers and by faulting along cracks in the earth's crust."
"Mountains are worn away by water and wind erosion and lowered by downward movement caused by faulting. Mountains are also formed by erosion when water and wind take away the soft rock making deep canyons."
"Mountains are also formed on the ocean floor. When the tops of these mountains stick out of the water they are called islands. So islands are really tops of mountains sticking out of the water. In the films today we will see how volcanic islands and mountains are formed."

CLASS ACTIVITIES

1. View film and/or filmstrip.
2. Assign task cards (see note; Lesson 4).

SUMMARY

1. Review highlights of the film and/or filmstrip.
2. Reports from students using task cards.

Note: The teacher will need to explain the following terms - volcanic-liquid flowing rock; folded-rock layers are tilted up or bent; faulted-movement of layers along a crack in the earth's crust; erosional-wearing away of rock.

Lesson 6
(Note: Lesson 7 is a continuation of Lesson 6.)

PURPOSE

To familiarize the students with the job of the Geomorphologist.

MATERIALS

1. Suggested filmstrip: Rocks and How They Change, 5211, and/or film, Finding Out About Rocks, 4980. (Available through Instructional Resource Center, Superintendent of Schools).
2. Filmstrip projector/film projector.
3. Task Cards 14, 15, also 7 and 16 from Lesson 7.

INTRODUCTION

Say: "Today we are going to learn about a special geologist called a Geomorphologist. That's a big word, so you say it with me: Geomorphologist. Geomorphologists study land formations and surface features. They study their origin or how they came to be and the forces that caused them, such as glaciers, erosion, and faulting. The films today will tell us about rocks and how they change. In our next lesson we will learn about glaciers."

CLASS ACTIVITIES

1. View filmstrip and/or film.
2. Assign task cards.

SUMMARY

1. Discuss highlights of the filmstrip and/or film.
2. Reports from groups using task cards.

Lesson 7

PURPOSE

To familiarize the students with the job of Geomorphologist. This is a continuation of Lesson 6.

MATERIALS

1. Model: Rock and Mineral Specimens.
2. Suggested films: Rocks, 5210; Yosemite National Park - The Four Seasons, 5381; Erosion, 5938; Why Do We Still Have Mountains, 597. (All available through Instructional Resource Center, Superintendent of Schools).
3. Film projector.
4. Task Cards 7 and 16, also 14 and 15 from Lesson 6.

INTRODUCTION

Say: "Today we are going to learn more about the work of the Geomorphologist. We are going to learn how glaciers and erosion cause the earth's surface to change. Can you remember other forces that we have already studied?" Draw from the students volcanic eruption, faulting, and folding to build mountains. "Can someone tell us what a glacier is?" A glacier is a permanent snow field that is moving.
"Snow fields are caused when year after year more snow falls than melts. Glaciers move along the surface and pick up rocks and boulders of all sizes. As the glaciers move, it is the rocks in the glacier that grind, break, and move great amounts of earth. The great Yosemite Valley in California was made by a glacier."
"When glaciers melt away they leave piles of rocks and often beautiful lakes and valleys. Glacier action is one type of erosion. Another type of erosion that the Geomorphologist studies is wind erosion. Wind picks up soil and carries it away. It can also carve away the soft rock on the sides of mountains. The films today will show us how glaciers and wind work."

CLASS ACTIVITIES

1. View films.
2. Assign task cards.

SUMMARY

1. Review highlights of films.
2. Reports from groups using task cards.

Lesson 8

PURPOSE

To familiarize the students with the job of the Paleontologist.

MATERIALS

1. Fossilized rock specimens. (Note: In Kern County, fossil rocks from Pyramid Hill and Sharks Tooth Mountain are often available. If not, look for appropriate library books, with pictures that are about fossils.)

2. Task Cards 17 through 20.

INTRODUCTION

Say: "Today we are going to learn about another special geologist called a paleontologist. A paleontologist studies and classifies (puts them in groups) animal and plant fossils. Can anyone tell us what a fossil is?"

Fossil: An animal dies and soft mud covers the animal. As the animal decays, the shells and bones are replaced by the mud. The mud becomes solid rock and looks like the animal. The fossil is all rock and no part of the real animal is left.

"By studying the fossils the paleontologist can tell when certain animals and plants lived on earth and how long there has been life on earth."

CLASS ACTIVITIES

1. Study fossilized rocks.

2. Have a class discussion covering material in note below.

3. Do task cards.

SUMMARY

Have reports given from groups using task cards.

Note: Be sure that the children understand that:

1. Fossils tell us about living things that are not living today.
2. Fossils are usually found in dried up seas or in sea cliffs that were once the sea floor.
3. Fossils can tell us where ancient seas were.
4. Fossils can tell us the age of certain rock layers if we know when an animal lived.
5. Fossils can tell us when certain animals lived by knowing the age of the layer it is found in.

Lesson 9

PURPOSE

To briefly describe working conditions, equipment, personal qualifications, educational requirements, and school skills necessary for the job of a geologist.

MATERIALS

1. Information Sheet, next page.
2. 12 x 18 newsprint to make peek pictures.
3. Direction sheet for peek pictures, following pages.

INTRODUCTION

Say: "Today we are going to find out about the working conditions, tools, and qualifications to become a geologist. I will need your help to fill in parts of the chart." Teacher prepares chart and headings ahead.

Headings:

Working Conditions - Where does a geologist work? Is it dangerous?

Personal Qualifications - What kind of a person would a geologist be? What would they be like?

Tools - What kind of tools would a geologist use?

School Skills - What school skills would be most useful? Why?

Education Requirements - Would you have to go to college to be a geologist?

Interest and Ability - What could you do to check if you would be interested or had the ability to become a geologist?

Where Employed - Who would hire a geologist?

CLASS ACTIVITIES

1. Complete chart with students.
2. Make peek pictures.

SUMMARY

Have students summarize the information by using their "peek pictures" as a reference.

Information Sheet

Geologists

Working Conditions:
Geologists have various working conditions depending on their field of specialization and assignment. They could work in an office, classroom, laboratory or outdoors where the weather is often unpleasant, the terrain hazardous and the living conditions primitive. In the exploratory field work the geologists may have to travel by truck, horse, or foot.

Personal Qualifications:
The person interested in a career in the area of geology should enjoy the out-of-doors and be willing and able to work outside at hard physical labor. A person interested in the field of geology should have skill in math and science and the ability to get along with all kinds of people.

Tools:
The tools a geologist uses depends greatly on what specific field of geology he/she is working in. In the laboratory, chemicals are used to analyze rock samples, in the ocean, a hollow drill is used to get a core sample from the ocean floor, and on the surface of the land the geologist may also take core samples to find oil or minerals. Paleontologists would use simple hand tools to dig out fossils. Maps and all types of measuring tools are used by geologists including the seismograph for studying earthquakes, faults, and the density of rock layers.

School Skills:
Geologists use a lot of math with the measurements that must be taken. They must read well and be able to write reports of findings. Scientific information from other fields of science is also used by geologists.

Education:
At the very least a college preparatory high school program rich in science and mathematics. A college degree and a master's degree to obtain professional status in the field. Geologists involved with research are generally required to have Ph D degrees.

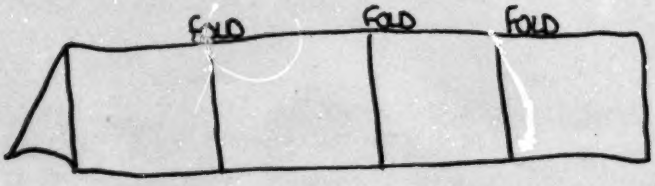
Measuring Your Interest and Ability:
Interest and ability in high school science and math courses and enjoying working outdoors with your hands is most indicative of interest and ability in geology. Start a rock collection and take excursions in your own area. Learn to identify and classify rocks. Join a rockhound or geology club. Read about geology in books and about geology explorations in magazines such as National Geographic.

Where Employed:
Almost half of the employed geologists work in private industry; 14 percent in the federal government; 29 percent in colleges; and 6 percent are self-employed. Others are employed by state and local governments, by high schools, and museums.

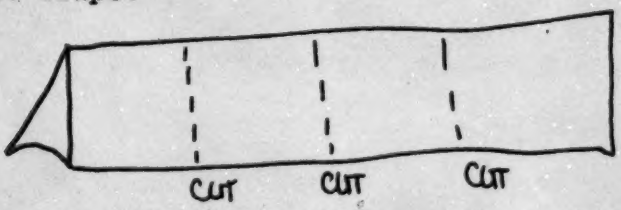
PEEK PICTURES

Using 12 x 18 lined newsprint, fold it in half:

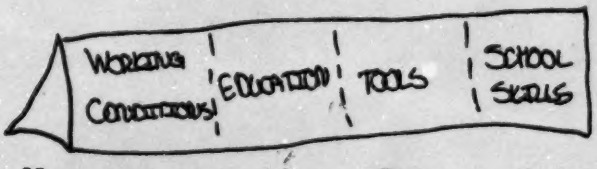
Now fold the paper again, so that there are four equal spaces:



Cut along the fold on the top paper only, so that you have 4 different flaps:



Think about a job as a geologist. On each flap, write one of these words:



Lift each flap one at a time. Draw a picture for each section to show as much about the job of a geologist as you can.

Lesson 10

PURPOSE

To evaluate what the children have learned about careers in geology.

MATERIALS

1. Tape recorder, tape.
2. Tape made at the beginning of the unit.
3. Entry Level Assessment.
4. All task cards.

INTRODUCTION

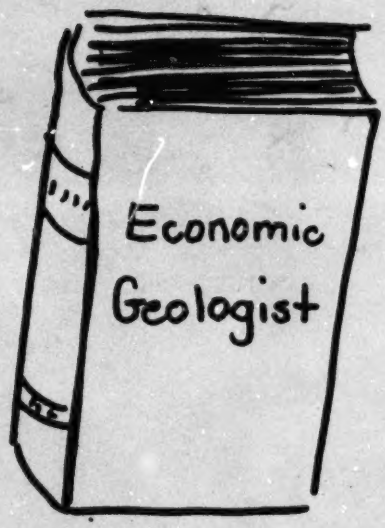
Say: "Today we will find out about how much we've learned about geologists. Let's listen to the tape we made before the unit began. Let's find out how much more we now know about geologists and their work."

CLASS ACTIVITIES

1. Listen to pre-test.
2. Make a new tape as a post-test.
3. Free use of all task cards.

SUMMARY

The children should feel free to comment on what they have learned. They should feel free to talk about things they have liked or disliked about certain lessons or the unit.



TASK CARD 1

BOOK REPORT

You need:

-a library book

-tutor or parent helper

-paper

-crayons

Select a library book about a job in the field of geology such as:

-Economic Geologist
-Petroleum Geologist
-Mineralogist
-Geohydrologist

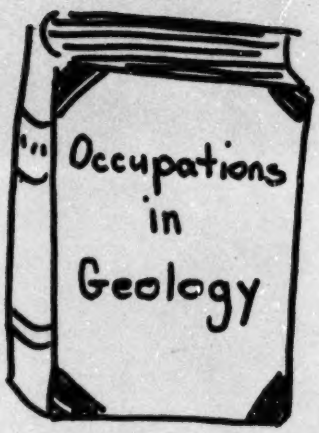
Read the book and plan a short book report. Your report should include:

-Title of book
-The field of geology that the scientist is in
-The kind of work the geologist does
-A picture to show why this field of geology is important to us

You may want to use the encyclopedia for your report.

Remember that the tutor can help with the reading.

TASK CARD 2



BOOK REPORT

You need:

-a library book

-a tutor or parent helper

-paper

-crayons

Select a library book about a job in the field of geology, such as:

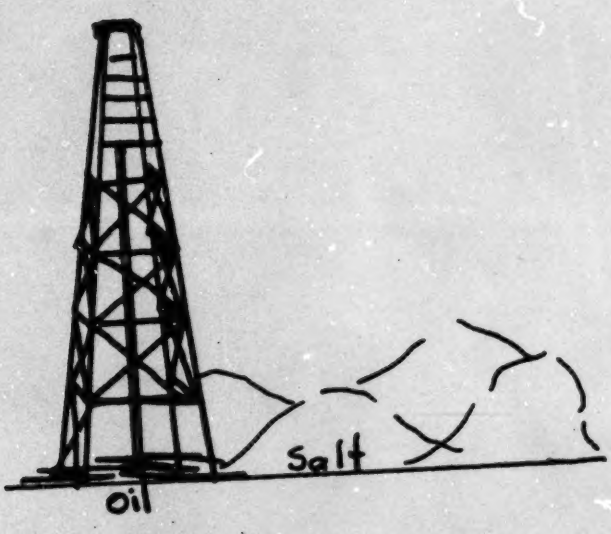
-Volcanologist (volcanoes)
-Selenologist (moon)
-Astrogeologist (moon, planets, solar system)
-Geographic Oceanographer or Geological Oceanographer or Marine Geologist (ocean bottom, rocks and formations)

Read the book and plan a short book report. Your report should include:

-Title of the book
-The field of geology the scientist is in
-The kind of work the geologist does
-A picture to show why this field of geology is important to us.

You may want to use the encyclopedia for your report.

Remember that the tutor can help with the reading.

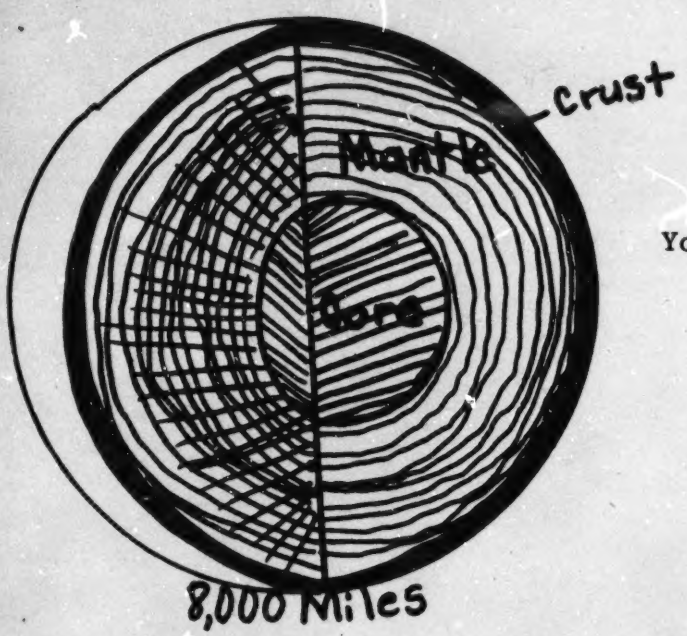


You need:

-paper

-felt pens or crayons

There are many good things that we can use that can be found in the earth. Geologists dig in the earth. Some of the things they find are: oil, salt, gold, coal. Can you think of ways we use such things? Color a picture to show how your family might use things found in the earth.



THE EARTH CHANGED AS IT FORMED

You need:

- -crayons
- -12 x 18 manila paper
- -tutor or parent helper

Some scientists believe the earth may have been very hot during the early part of its formation. If the earth was hot, the gases that made up most of the material of the earth began to cool quickly. The gases changed into a liquid to form a ball-shaped mass.

The outer part of the liquid mass cooled more quickly than the inner part forming the surface of the earth. The part under the crust remained as a liquid.

Color a picture to show the outer part of the young earth and the inner part of the young earth.

HOW OLD IS THE EARTH?

Layers of rock

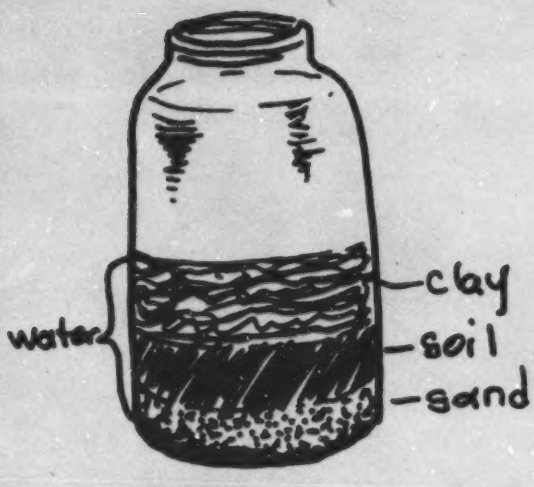
You need:

- -12 x 18 manila paper
- -crayons
- -encyclopedia
- -tutor or parent helper

Geologists have been able to estimate the age of the earth by studying layers of rocks and by measuring the energy given off by radioactive rocks. It is believed that the earth may be about five billion years old.

In the Grand Canyon, geologists have found layers of rock that were formed hundreds of millions of years ago.

Use the encyclopedia to find a picture of the Grand Canyon. Color a picture to show many layers of rock.



FORMATION OF ROCK LAYERS

You need:

- -a large glass jar half-filled with water
- -sand
- -black top soil
- -clay
- -a tutor or parent helper

Drop a handful of sand into the jar of water. Let it settle to the bottom.

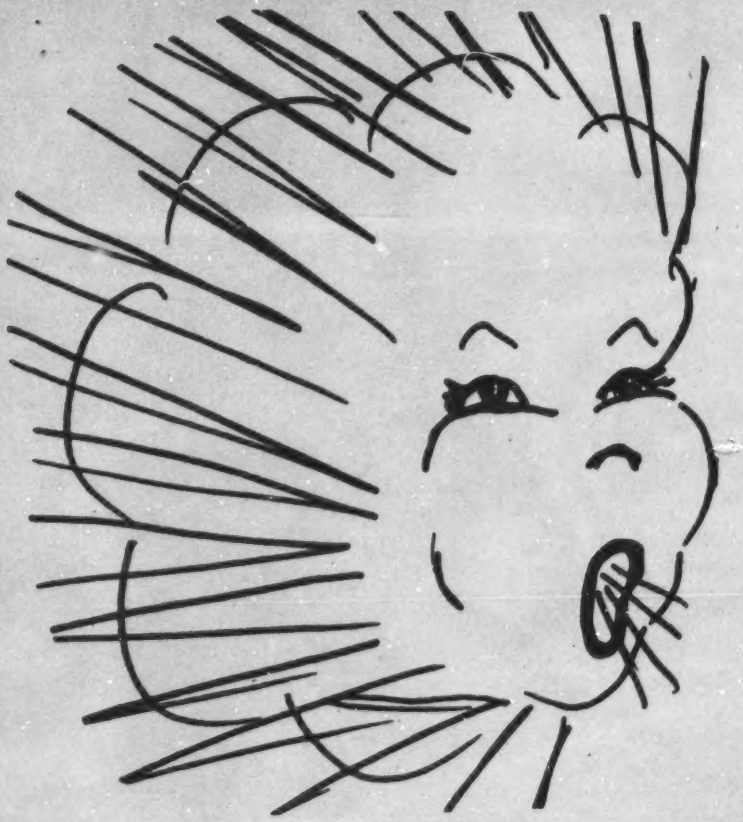
Drop a handful of soil into the jar of water. Let it settle until it forms a layer. If you were able to get two kinds of soil, drop a handful of one type at a time.

If there is enough room make more layers of sand and soil.

Can you see the layers of soil through the glass? Layers of rock in the earth look something like that.

Wait one week. Try to push a stick down into the layers. What has happened?

Report your findings to the class.



WIND

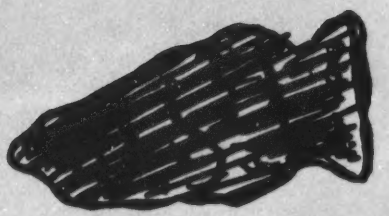
You need:

-crayons

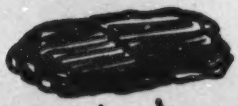
-papers

-a tutor or parent helper

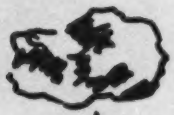
Wind changes the earth. Wind and water can take soil away. Plants will hold the soil so that the wind and water will not cause erosion. Look around the school yard. Can you see areas of soil erosion? Color a picture to show how wind and water together can cause the earth to change.



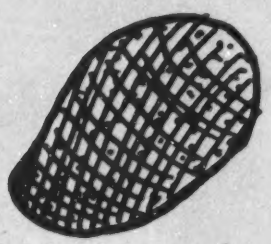
Flint Arrowhead



Shale



Limestone



Gray Quartz Pebble

Smoky Quartz Crystals

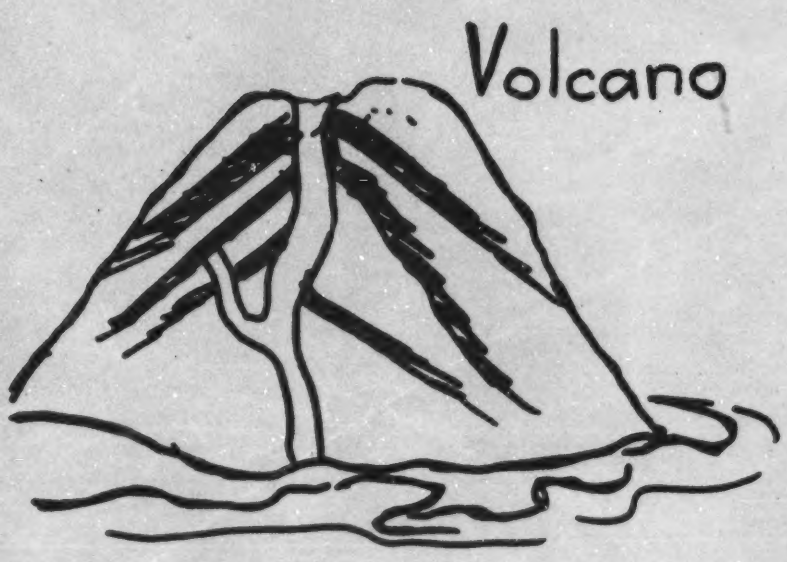
START A COLLECTION

You need:

- -12 x 18 chipboard
- -glue
- -rocks
- -tutor or parent helper

Rocks are interesting to collect and study. They tell the story of what the earth was like, long ago. Rocks can tell us how the earth has changed. Make a rock collection. Mount the rocks on chipboard. Label as many as you can. The book Rocks and Minerals can help you.

VOLCANO



You need:

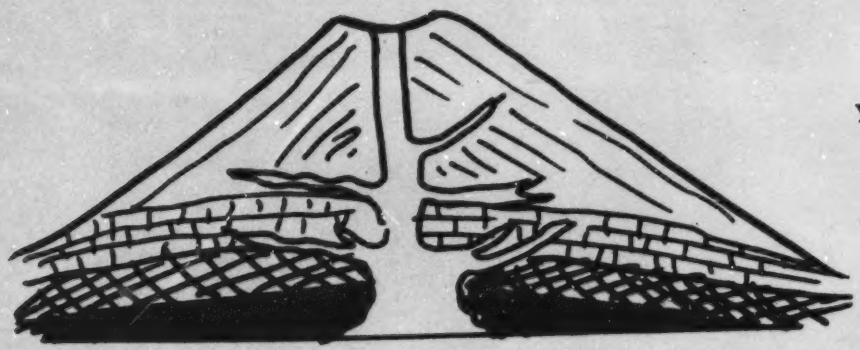
-red, orange, yellow, black crayons

-paper, 12 x 18

-tutor or parent helper

It is hot inside the earth. The rock melts. The hot rock must get out. The rock comes up through openings in the earth. The hot rock moves slowly across the top of the earth. This is a volcano. Make a picture to show a volcano. Use the yellow, red and orange crayons. Color all over your paper mixing the colors together. Use your black crayon to make the volcano. Your volcano will be black and the sky will look hot.

MOUNTAINS



Volcano

You need:

-paper

-crayons

The surface of the earth has changed since the earth was formed. The earth is still changing.

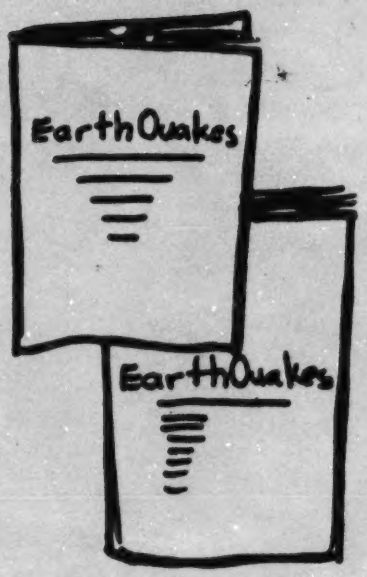
Mountains are masses of rock which are higher than the land around them. Geologists have found that mountains are formed in many different ways.

One way a mountain is formed is by volcanic action. Hot, liquid rock is forced through cracks in rocks. It comes to the surface. The melted rock, steam and ashes that are forced through a hole in the surface may form a mountain called a volcano.

Color a picture of a volcano. You may want to find a library book on Volcanoes to help.

If you have time, look up and report on a famous volcano:

-Mauna Loa
-Paricutin



EARTHQUAKES

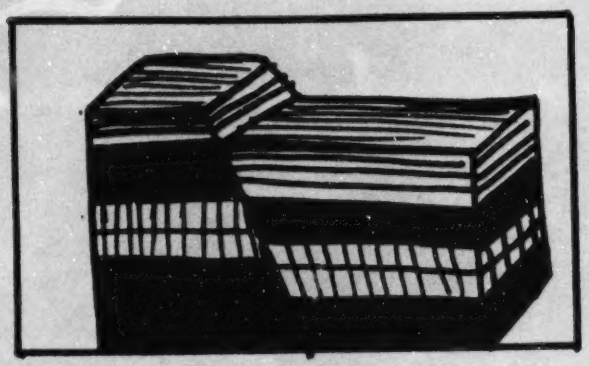
You need:

-library book on Earthquakes

-tutor or parent helper

Earthquakes happen when large masses of rock slip past each other suddenly. The shock and vibrations are recorded on a seismograph. Some shocks can be so strong that they destroy buildings and do great damage. Some earthquakes are so mild that they are not noticed.

Find a book on earthquakes in the school library. Read and report your findings to the class. The tutor or parent helper can read to you.



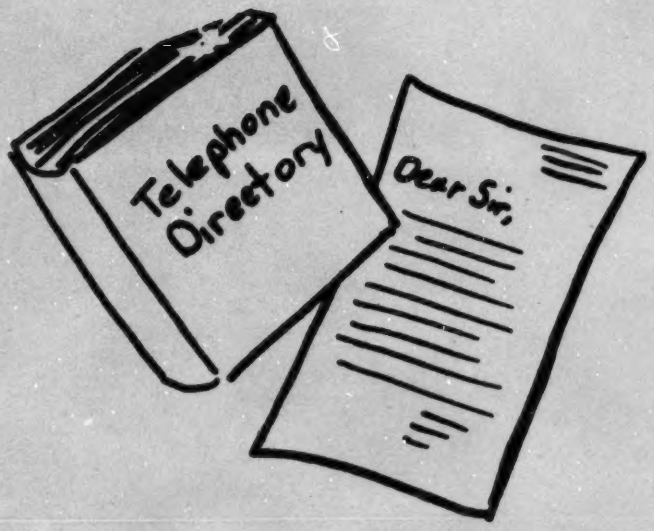
EARTHQUAKES

You need:

-telephone

-tutor or parent helper

Rocks inside the earth slide. They can slide slowly up and down. Sometimes they slide very fast. When that happens there may be an earthquake. The slides in the earth are called faults. Structural geologists study faults and earthquakes. Telephone your parent or grandparent. Ask them to tell you about an earthquake they've experienced. You may want to color a picture to show the earthquake.



You need:

-paper

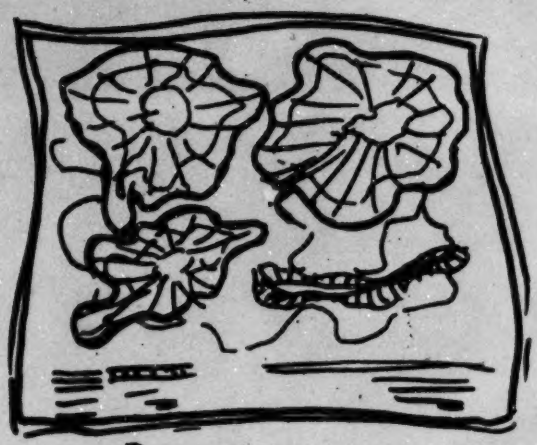
-pencil

-tutor or parent helper

-telephone directory

Write a letter to the state park department for information about interesting rock formations in your state. Have a classroom helper look in the telephone directory to find the address of the park department.

TASK CARD 14



RELIEF MAP

You need:

-12 x 18 chipboard

-paint

-crayon

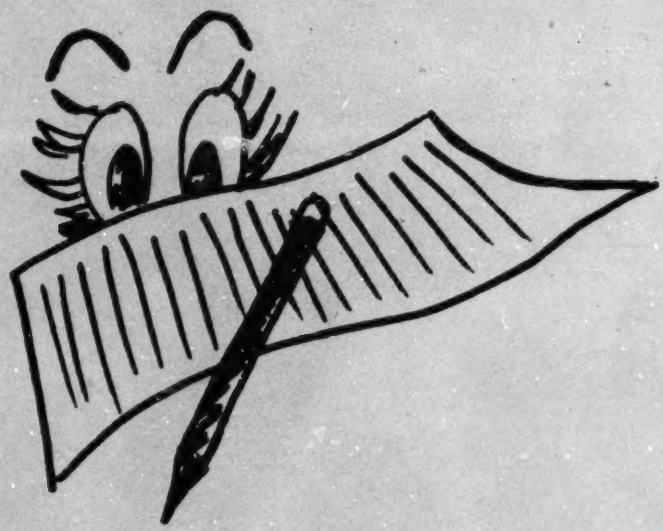
-modeling clay

-a globe

-a tutor or parent helper

Photo-Geologists examine and interpret aerial photographs of the earth and its land formations.

Make an outline of one of the earth's continents. Study the globe so that you will know something about the land formation. Paint the map. Use clay to show mountain areas. The clay will stick to the chipboard. This is called a relief map.



INVESTIGATE

You need:

-paper

-pencil

-keen eyes

-tutor or parent helper

Geomorphologists are geologists that study land formations. They study the forces of nature such as erosion and glaciers which cause the different land formations.

Pretend you are a geologist. Take a walk around the school. Can you see any signs of soil erosion? Can you tell what caused the erosion? Record your findings and share your report with the class.

You need:

-a library book on glaciers

-tutor or parent helper

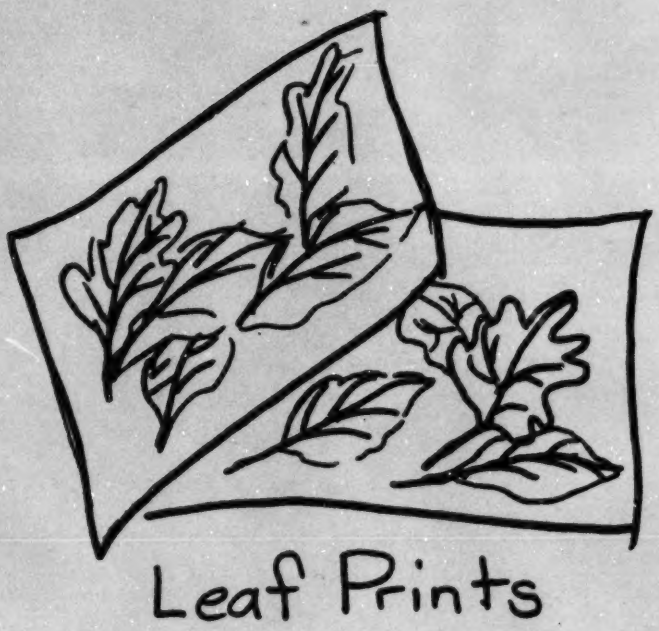
A glacier is a slowly moving mass of ice. Glaciers have caused changes in the surface of the earth. There have been times, long ago, when parts of land on the earth were covered with ice.

The movement of the glacier can be traced by looking at the scratches made in the layers of rock it passed.

Today glaciers are changing the surface of the earth in mountain areas of Greenland and in Antarctica.

The knifelike edge of the Matterhorn in Switzerland was caused by glacial action.

Find a book on glaciers in the library. Read and report your findings to the class.



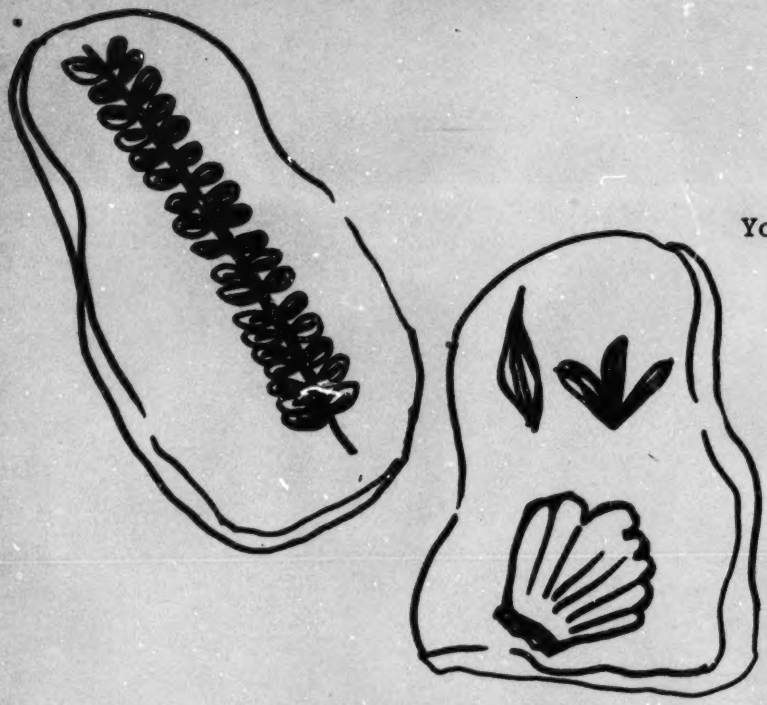
LEAF PRINTS

You need:

- -2 pieces of 8½ x 11 newsprint
- -scissors
- -several leaves
- -crayons
- -12 x 18 construction paper
- -paste
- -tutor or parent helper

Paleontologists are geologists who are experts on fossils. Most of what we know about the earth's past has come from the study of fossils.

Make a leaf print picture. It will look something like a fossil. Put leaves between the two pieces of newsprint. Color the top paper pressing a bit over the place that has a leaf under it. Use different colors for each leaf. Cut the leaf prints out and arrange them on a piece of construction paper.



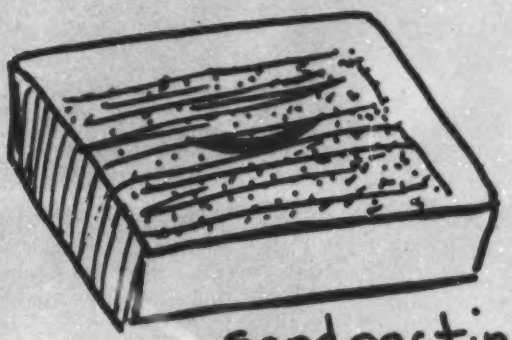
LONG, LONG AGO

You need:

- -crayons
- -12 x 18 manila paper
- -Book: Concepts in Science
- -tutor or parent helper

Paleontologists study, identify, and classify animal and plant fossils. These geologists dig for bones of animals like dinosaurs and mammoths.

Make a poster to show many kinds of plants and animals that lived long ago when the earth was different.



sand casting

You need:

-plaster of paris

-shells

-tub of sand

-tutor or parent helper

Make a model of a fossil. Use plaster of paris. Dig a small hole in the sand. Place your shells in the hole. Mix the plaster of paris with water. Pour it over the shells. Let it set before you remove your model from the sand. That will take about 5 minutes.

SECRETS IN ROCKS

You need:

-spoon

-tutor or parent helper

Geologists called paleontologists dig in the earth. They find many rocks. The scientists study the rocks. The rocks tell many things about the earth. Take a walk to the playground or a garden area in the school grounds. Use your spoon to dig in the earth. Can you find some interesting rocks? What can you discover about the earth from the rocks you find?